

THE HYBRID ORIGIN OF  
HELIANTHUS DORONICOIDESR. C. JACKSON<sup>1</sup>

*Helianthus doronicoides* was named and described by Lamarck in 1789 from a specimen under cultivation in the Jardin du Roi. Lamarck believed that the original material had come from North America. The type specimen is deposited in the Muséum National d'Histoire Naturelle in Paris, France. A photograph of the type specimen (Plate 1225) has been studied and supplemental information has been kindly supplied by Dr. Arthur Cronquist who has examined the type.

In nature *H. doronicoides* appears to be extremely rare. Watson (1929) lists several specimens which he considered to be *H. doronicoides*, but he never found this species in his extensive collecting of the genus. Deam (1940) concluded that the species was one of the rarest sunflowers in Indiana. He once collected it growing naturally in Marshall County and transplanted a part of the clone to his garden in Bluffton, Indiana.

A study of herbarium collections of *H. doronicoides* has shown that, for the most part, specimens designated as this species are fragments of other perennial taxa of *Helianthus*. Commonly, the upper portion of *H. tuberosus* L. and *H. strumosus* L. have been labeled *H. doronicoides*. Cronquist (private communication) has previously found miscellaneous collections of misfits under the name *H. doronicoides* in several herbaria, and has omitted this species from Gleason's Flora.

The rarity of *H. doronicoides* in nature has led to the suspicion that it is, perhaps, of hybrid origin. Morphologically the species appears closest to *H. mollis* Lam. Both species have sessile leaves, and the two main lateral veins diverge from the midrib some distance from the leaf base. However, the phyllary shape, general pubescence, and height of the two species are somewhat different. Watson (1929) has suggested that *H. mollis* and *H. tomentosus* Michx. are the two closest relatives of *H. doronicoides*.

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An attempt to relocate the clone of *H. doronicoides* from which Deam made his collection was unsuccessful. In the same county, however, several populations of putative hybrids between *H. mollis* and *H. giganteus* L. were found. Among these hybrids were a number of plants fitting the description of *H. doronicoides*. Some of the hybrids were possibly backcrosses, but generally there was little morphological variation from one population to another. In Indiana the two parental species are ecologically separated. *Helianthus giganteus* is found in decidedly wet habitats along streams, in old lake beds, and in wet prairie. On the other hand, *H. mollis* usually occurs in drier sites along fence-rows, railroad right-of-ways, on low sand ridges, and prairie areas. Where the two species occupy adjacent and disturbed habitats hybrids have been found. Deam's specimen of *H. doronicoides* was collected along an open ditch through a cleared field.

A program of artificial hybridization and cytological study was initiated in order to synthesize *H. doronicoides* and to determine its affinities with those species to which it appeared to be more closely related morphologically. Seeds of *H. doronicoides* had previously been obtained from Deam, and this species along with *H. mollis*, *H. giganteus*, and *H. tomentosus* was grown in the Experimental Garden at Indiana University. Cytological examination of the species revealed that *H. tomentosus* was hexaploid with  $n = 51$ . *Helianthus mollis* and *H. doronicoides* were both diploid with  $n = 17$ . The chromosome number of *H. giganteus* was  $n = 17$  as reported by Geisler (1931). *Helianthus doronicoides* was found to have 68 per cent stainable pollen while in the other species the pollen was approximately 100 per cent stainable.

Hybrids between *H. mollis* and *H. doronicoides*, *H. mollis* and *H. giganteus*, *H. doronicoides* and *H. giganteus* were obtained. All crosses of these species to *H. tomentosus* were unsuccessful. In the cross of *H. doronicoides* to *H. mollis* and *H. giganteus* there was an increase in the fertility of the few hybrids obtained over that found for *H. doronicoides*. Meiosis in the progeny appeared to be normal, and they were morphologically intermediate for the parental characters. The  $F_1$  hybrid between *H. mollis* and *H. giganteus* was somewhat intermediate for





*Helianthus doronicoides* Lam.  
dict.

HERB. MUS. PARIS.  
*Helianthus doronicoides* Lam.  
Type

MUSEUM DE LONDON.  
Acquis. November 1906.



characters of the two parents, but it resembled *H. giganteus* more closely in leaf and phyllary shape. Phyllary length of the hybrid exceeded that of either parent. In comparison with the type of *H. doronicoides*, the leaves of the F<sub>1</sub> were narrower and less pubescent. However, among the progeny of a backcross to *H. mollis* there were a number of plants which were morphologically very close to the type of *H. doronicoides*. Other progeny of the backcross exhibited a series of character gradations between the F<sub>1</sub> and the recurrent parent.

Meiosis was studied in the hybrid between *H. mollis* and *H. giganteus*. Seventeen bivalents were found in 50 microsporocytes studied at diakinesis. At first metaphase fragments were found in 28 of 50 cells examined. A single chromatin bridge was observed in a few cells at first anaphase. The hybrid yielded 57.9 per cent stainable pollen. Inasmuch as bridges were not found in either of the two parental species, it is quite possible they differ for at least one inversion.

All available evidence indicates that *H. doronicoides* is of hybrid origin, and that this species epithet was applied to a hybrid derivative from a natural cross between *Helianthus mollis* and *H. giganteus*. According to the International Code of Botanical Nomenclature a putative hybrid between two species of the same genus may be designated by a formula or by a name. Since the epithet *H. doronicoides* has been in the literature for some time, it is retained here under a new status.

***Helianthus* × *doronicoides* Lamarck (pro sp.)**

*Helianthus doronicoides* Lam. Encyc. **3**: 84. 1789.

SPECIMENS EXAMINED: NEW JERSEY. Atlantic County: Sept. 14, 1896, C. A. Gross (ILLS). INDIANA. Marshall County: along an open ditch through a cleared field, Sept. 21, 1930, Deam 49921 (IND). Starke County: along a highway drainage ditch, Sept. 1, 1953, Jackson 706-10 (IND); on excavation of a newly dug drainage ditch, Aug. 29, 1954, Jackson 710-25 (IND). Sullivan County: 4 miles west of Shelburn, Aug. 24, 1912, Deam 12156 (IND). ILLINOIS. Sangamon County, Barrens, Spring Creek, Sept. 1860, E. Hall (F).

Although a number of hybrid populations were located, observations over a two year period indicated that they were not competing successfully with the parental and other species in the disturbed habitats. Three small populations seen in 1953 were not found in 1954, and some of the larger populations were